

## WHAT IS CLAIMED IS:

1. An isolated soluble complex comprising at least  
6 amino acids of the mature protein portion of SEQ ID NO:  
5 2 or 4, and:
  - a) at least 6 amino acids of the mature protein  
portion of SEQ ID NO: 12 or 13; or
  - b) at least 6 amino acids of the mature protein  
portion of the CNTF-R.
- 10 2. The complex of Claim 1, wherein said complex:
  - a) comprises a recombinant polypeptide of mature SEQ  
ID NO: 2 or 4;
  - 15 b) comprises a recombinant polypeptide of mature SEQ  
ID NO: 12 or 13;
  - c) comprises a recombinant polypeptide of mature  
CNTF-R;
  - d) comprises both a recombinant polypeptide of  
mature SEQ ID NO: 2 or 4, and a recombinant  
20 polypeptide of mature SEQ ID NO: 12 or 13;
  - e) comprises both a recombinant polypeptide of  
mature SEQ ID NO: 2 or 4, and a recombinant  
polypeptide of mature CNTF-R;
  - f) is detectably labeled;
  - 25 g) is in a buffered solution; or
  - h) is in a sterile solution.
3. The complex of Claim 1, which:
  - a) comprises a mature IL-B60 polypeptide;
  - 30 b) comprises a mature CLF-1 polypeptide;
  - c) comprises a mature CNTF-R polypeptide;
  - d) exhibits at least four nonoverlapping segments of  
at least seven amino acids of SEQ ID NO: 2 or 4;
  - e) exhibits epitopes from both primate L-B60 and  
35 primate CLF-1;

- f) exhibits epitopes from both primate L-B60 and primate CNTF-R;
  - g) is not glycosylated;
  - h) is attached to a solid substrate;
  - 5 i) is conjugated to another chemical moiety; or
  - j) comprises a detection or purification tag, including a FLAG, His6, or Ig sequence.
4. A kit comprising said complex of Claim 1, and:
- 10 a) a compartment comprising said complex; or
  - b) instructions for use or disposal of reagents in said kit.
5. An isolated or recombinant polypeptide
- 15 comprising:
- a) a first segment comprising at least seven amino acids identical to segments of SEQ ID NO: 2 or 4, and a second segment comprising at least seven amino acids identical to segments of
  - 20 mature SEQ ID NO: 12 or 13;
  - b) at least two distinct nonoverlapping segments of at least five amino acids identical to segments of mature SEQ ID NO: 2 or 4, and a third segment comprising at least seven amino acids identical
  - 25 to segments of mature SEQ ID NO: 12 or 13;
  - c) at least one segment comprising at least seven amino acids identical to segments of mature SEQ ID NO: 2 or 4, and two distinct nonoverlapping segments of at least five amino acids identical
  - 30 to segments of mature SEQ ID NO: 12 or 13;
  - d) a first segment comprising at least seven amino acids identical to segments of SEQ ID NO: 2 or 4, and a second segment comprising at least seven amino acids identical to segments of
  - 35 mature primate CNTF-R;

- 5 e) at least two distinct nonoverlapping segments of  
at least five amino acids identical to segments  
of mature SEQ ID NO: 2 or 4, and a third segment  
comprising at least seven amino acids identical  
to segments of mature primate CNTF-R; or
- 10 f) at least one segment comprising at least seven  
amino acids identical to segments of mature SEQ  
ID NO: 2 or 4, and two distinct nonoverlapping  
segments of at least five amino acids identical  
to segments of mature primate CNTF-R.

6. The polypeptide of Claim 5, wherein said  
distinct nonoverlapping segments of identity:
- 15 a) include one of at least eight amino acids;  
b) include one of at least five amino acids and a  
second of at least six amino acids;  
c) include at least three segments of at least four,  
five, and six amino acids, or  
d) include one of at least twelve amino acids.

- 20 7. The polypeptide of Claim 5, which:
- a) comprises a mature IL-B60 sequence;  
b) comprises a mature CLF-1 sequence;  
c) comprises a mature CNTF-R sequence;
- 25 d) exhibits at least four nonoverlapping segments of  
at least seven amino acids of SEQ ID NO: 2 or 4;  
e) has a length at least about 30 amino acids;  
f) exhibits epitopes from both primate IL-B60 and  
primate CLF-1;
- 30 g) exhibits epitopes from both primate IL-B60 and  
primate CNTF-R;  
h) is not glycosylated;  
i) has a molecular weight of at least 30 kD;  
j) is a synthetic polypeptide;
- 35 k) is attached to a solid substrate;  
l) is conjugated to another chemical moiety; or

- m) comprises a detection or purification tag, including a FLAG, His6, or Ig sequence.
8. A composition comprising:
- 5 a) substantially pure combination of IL-B60 and CLF-1;
  - b) substantially pure combination of IL-B60 and CNTF-R;
  - c) a sterile polypeptide of Claim 5; or
  - 10 d) said polypeptide of Claim 5 and a carrier, wherein said carrier is:
    - i) an aqueous compound, including water, . saline, and/or buffer; and/or
    - 15 ii) formulated for oral, rectal, nasal, topical, or parenteral administration.
9. A kit comprising a polypeptide of Claim 5, and:
- a) a compartment comprising said polypeptide; or
  - 20 b) instructions for use or disposal of reagents in said kit.
10. A method:
- 25 a) of making an antibody which recognizes a complex of Claim 1, comprising inducing an immune response in an animal with said complex;
  - b) of immunoselecting antibodies, comprising contacting a population of antibodies to a complex of Claim 1, and separating antibodies that bind from those which do not bind; or
  - 30 c) of formulating a composition, comprising admixing a complex of Claim 1 with a carrier.
11. A binding compound comprising an antigen binding site from an antibody, which antibody specifically binds
- 35 said complex of Claim 2d or 2e, but not to any of said mature polypeptides of SEQ ID NO: 2, 4, 12, 13, or CNTF-R.

12. The binding compound of Claim 11, wherein:
- a) said binding compound is:
    - i) in a container;
    - 5 ii) an Fv, Fab, or Fab2 fragment; or
    - iii) conjugated to another chemical moiety; or
  - b) said antibody:
    - i) is raised against a substantially pure complex of IL-B60 with CLF-1;
    - 10 ii) is raised against a substantially pure complex of IL-B60 with CNTF-R;
    - iii) is immunoselected;
    - iv) is a polyclonal antibody;
    - v) exhibits a Kd to antigen of at least 30  $\mu$ M;
    - 15 vi) is attached to a solid substrate, including a bead or plastic membrane;
    - vii) is in a sterile composition; or
    - viii) is detectably labeled, including a radioactive or fluorescent label.
- 20
13. A composition comprising:
- a) a sterile binding compound of Claim 12, or
  - b) said binding compound of Claim 12 and a carrier, wherein said carrier is:
    - 25 i) an aqueous compound, including water, saline, and/or buffer; and/or
    - ii) formulated for oral, rectal, nasal, topical, or parenteral administration.
- 30
14. A kit comprising said binding compound of Claim 11, and:
- a) a compartment comprising said binding compound; or
  - b) instructions for use or disposal of reagents in
  - 35 said kit.

15. A method of producing an antigen:antibody complex, comprising contacting under appropriate conditions a primate complex comprising:
- a) IL-B60 and CLF-1 polypeptides; or
  - 5 b) IL-B60 and CNTF-R polypeptides;
- with an antibody of Claim 11, thereby allowing said complex to form.
16. The method of Claim 15, wherein:
- 10 a) said complex is purified from other cytokines;
  - b) said complex is purified from other antibody;
  - c) said contacting is with a sample comprising a cytokine;
  - d) said contacting allows quantitative detection of
  - 15 said antigen;
  - e) said contacting is with a sample comprising said antibody; or
  - f) said contacting allows quantitative detection of said antibody.
- 20
17. An isolated or recombinant nucleic acid:
- a) encoding said amino acid portions of Claim 5;
  - b) encoding said amino acid portions of Claim 5, and
  - 25 comprise a segment at least 30 contiguous nucleotides from SEQ ID NO: 1 or 3;
  - c) which will coexpress a segment of at least seven contiguous amino acids from SEQ ID NO: 2 or 4, and a segment of at least seven contiguous amino acids from SEQ ID NO: 12 or 13; or
  - 30 d) which will coexpress a segment of at least seven contiguous amino acids from SEQ ID NO: 2 or 4, and a segment of at least seven contiguous amino acids from CNTF-R.
- 35
18. The nucleic acid of Claim 17, which:
- a) encodes IL-B60 from a human;

- b) encodes CLF-1 from a human;
  - c) encodes CNTF-R from a human;
  - d) is an expression vector;
  - e) further comprises an origin of replication;
  - 5 f) comprises a detectable label;
  - g) comprises synthetic nucleotide sequence; or
  - h) is less than 6 kb, preferably less than 3 kb.
19. A cell comprising said recombinant nucleic acid  
10 of Claim 18.
20. The cell of Claim 19, wherein said cell is:
- a) a prokaryotic cell;
  - b) a eukaryotic cell;
  - 15 c) a bacterial cell;
  - d) a yeast cell;
  - e) an insect cell;
  - f) a mammalian cell;
  - g) a mouse cell;
  - 20 h) a primate cell; or
  - i) a human cell.
21. A kit comprising said nucleic acid of Claim 18,  
and:
- 25 a) a compartment comprising said nucleic acid;
  - b) a compartment further comprising a primate IL-  
B60 polypeptide;
  - c) a compartment further comprising a primate CLF-1  
polypeptide;
  - 30 d) a compartment further comprising a primate CNTF-  
R polypeptide; or
  - e) instructions for use or disposal of reagents in  
said kit.

22. A method:

- 5 a) of making a duplex nucleic acid, comprising  
contacting a nucleic acid of Claim 17 with a  
complementary nucleic acid under appropriate  
conditions, thereby forming said duplex;
- b) of expressing a polypeptide, comprising  
expressing said nucleic acid of Claim 17,  
thereby producing said polypeptide; or
- 10 c) of transfecting a cell, comprising contacting  
said cell under appropriate conditions with said  
nucleic acid of Claim 17.

23. An isolated or recombinant nucleic acid which  
encodes at least 5 contiguous amino acids of SEQ ID NO:  
15 12, 13, or primate CNTF-R and:

- a) hybridizes under wash conditions of 30 minutes at  
30° C and less than 2M salt to the coding  
portion of SEQ ID NO: 1; or
- 20 b) exhibits identity over a stretch of at least  
about 30 nucleotides to a primate IL-B60.

24. The isolated nucleic acid of Claim 23, wherein:

- a) said contiguous amino acids number at least 8;
- 25 b) said wash conditions are at 45° C and/or 500 mM  
salt; or
- c) said stretch is at least 55 nucleotides.

25. The recombinant nucleic acid of Claim 23,  
wherein:

- 30 a) said contiguous amino acids number at least 12;
- b) said wash conditions are at 55° C and/or 150 mM  
salt; or
- c) said stretch is at least 75 nucleotides.

35 26. A method of modulating physiology or development  
of a cell or tissue culture cells comprising contacting



said cell with an agonist or antagonist of a complex comprising mammalian IL-B60 and:

- a) CLF-1; or
- b) CNTF-R.

5

27. A method of:

- a) producing a complex of Claim 1, comprising coexpressing a recombinant IL-B60 with a recombinant CLF-1 or CNTF-R;
- 10 b) increasing the secretion of an IL-B60 polypeptide comprising expressing said polypeptide with CLF-1; or
- c) increasing the secretion of a CLF-1 polypeptide, comprising expressing said CLF-1 with an IL-B60.

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28. The method of Claim 27, wherein:

- a) said increasing is at least 3 fold; or
- b) said expressing is of a recombinant nucleic acid encoding one or both of said polypeptide and
- 20 CLF-1.

29. A method of screening for a receptor which binds said complex of Claim 1, comprising contacting said complex to a cell expressing said receptor under

25 conditions allowing said complex to bind to said receptor, thereby forming a detectable interaction.

30. The method of Claim 29, wherein said interaction results in a physiological response in said cell.

## SEQUENCE LISTING

5 SEQ ID NO: 1 is a primate IL-B60 natural nucleic acid sequence.  
 SEQ ID NO: 2 is a primate IL-B60 natural amino acid sequence.  
 SEQ ID NO: 3 is a rodent IL-B60 natural nucleic acid sequence.  
 SEQ ID NO: 4 is a rodent IL-B60 natural amino acid sequence.  
 SEQ ID NO: 5 is a rodent LIF.  
 SEQ ID NO: 6 is a primate LIF.  
 10 SEQ ID NO: 7 is a primate CT-1.  
 SEQ ID NO: 8 is a rodent CT-1.  
 SEQ ID NO: 9 is a primate CNTF.  
 SEQ ID NO: 10 is a rodent CNTF.  
 SEQ ID NO: 11 is a primate DNAX IL-40.  
 15 SEQ ID NO: 12 is a primate CLF-1.  
 SEQ ID NO: 13 is a rodent CLF-1.

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 Timans, Jacqueline C.  
 Kastelein, Robert A.  
 Bazan, J. Fernando

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 130 135 140  
 Ala Ala Ala Arg Gly Pro Gly Pro Glu Pro Val Thr Val Ala Thr Leu  
 145 150 155 160  
 10 Phe Thr Ala Asn Ser Thr Ala Gly Ile Phe Ser Ala Lys Val Leu Gly  
 165 170 175  
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 15 Asp Leu Gly Gln Leu Val Pro Gly Gly Val Ala  
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 Ala Leu Thr Glu Ser Tyr Val Lys His Gln Gly Leu Asn Lys Asn Ile  
 35 40 45  
 35 Asn Leu Asp Ser Ala Asp Gly Met Pro Val Ala Ser Thr Asp Gln Trp  
 50 55 60  
 Ser Glu Leu Thr Glu Ala Glu Arg Leu Gln Glu Asn Leu Gln Ala Tyr  
 65 70 75 80  
 40 Arg Thr Phe His Val Leu Leu Ala Arg Leu Leu Glu Asp Gln Gln Val  
 85 90 95  
 45 His Phe Thr Pro Thr Glu Gly Asp Phe His Gln Ala Ile His Thr Leu  
 100 105 110  
 Leu Leu Gln Val Ala Ala Phe Ala Tyr Gln Ile Glu Glu Leu Met Ile  
 115 120 125  
 50 Leu Leu Glu Tyr Lys Ile Pro Arg Asn Glu Ala Asp Gly Met Pro Ile  
 130 135 140  
 Asn Val Gly Asp Gly Gly Leu Phe Glu Lys Lys Leu Trp Gly Leu Lys  
 145 150 155 160  
 55 Val Leu Gln Glu Leu Ser Gln Trp Thr Val Arg Ser Ile His Asp Leu  
 165 170 175  
 60 Arg Phe Ile Ser Ser His Gln Thr Gly Ile Pro Ala Arg Gly Ser His  
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Tyr Ile Ala Asn Asn Lys Lys Met  
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15 Cys Ser Arg Ser Ile Trp Leu Ala Arg Lys Ile Arg Ser Asp Leu Thr  
                   20                  25                  30

Ala Leu Met Glu Ser Tyr Val Lys His Gln Gly Leu Asn Lys Asn Ile  
           35                  40                  45

20 Ser Leu Asp Ser Val Asp Gly Val Pro Val Ala Ser Thr Asp Arg Trp  
       50                  55                  60

25 Ser Glu Met Thr Glu Ala Glu Arg Leu Gln Glu Asn Leu Gln Ala Tyr  
       65                  70                  75                  80

Arg Thr Phe Gln Gly Met Leu Thr Lys Leu Leu Glu Asp Gln Arg Val  
                   85                  90                  95

30 His Phe Thr Pro Thr Glu Gly Asp Phe His Gln Ala Ile His Thr Leu  
                   100                  105                  110

Thr Leu Gln Val Ser Ala Phe Ala Tyr Gln Leu Glu Glu Leu Met Ala  
           115                  120                  125

35 Leu Leu Glu Gln Lys Val Pro Glu Lys Glu Ala Asp Gly Met Pro Val  
       130                  135                  140

40 Thr Ile Gly Asp Gly Gly Leu Phe Glu Lys Lys Leu Trp Gly Leu Lys  
       145                  150                  155                  160

Val Leu Gln Glu Leu Ser Gln Trp Thr Val Arg Ser Ile His Asp Leu  
                   165                  170                  175

45 Arg Val Ile Ser Ser His His Met Gly Ile Ser Ala His Glu Ser His  
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Tyr Gly Ala Lys Gln Met  
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5	Ala	Leu	Ala	Leu	Ala	Asn	Leu	Asn	Gly	Ser	Arg	Gln	Arg	Ser	Gly	Asp	
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	Asn	Leu	Val	Cys	His	Ala	Arg	Asp	Gly	Ser	Ile	Leu	Ala	Gly	Ser	Cys	
			115					120					125				
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	Ser	Lys	Asn	Met	Lys	Asp	Leu	Thr	Cys	Arg	Trp	Thr	Pro	Gly	Ala	His	
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	Gly	Glu	Thr	Phe	Leu	His	Thr	Asn	Tyr	Ser	Leu	Lys	Tyr	Lys	Leu	Arg	
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20	Trp	Tyr	Gly	Gln	Asp	Asn	Thr	Cys	Glu	Glu	Tyr	His	Thr	Val	Gly	Pro	
				180					185					190			
	His	Ser	Cys	His	Ile	Pro	Lys	Asp	Leu	Ala	Leu	Phe	Thr	Pro	Tyr	Glu	
			195					200					205				
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	Leu	Thr	Leu	Asp	Ile	Leu	Asp	Val	Val	Thr	Thr	Asp	Pro	Pro	Pro	Asp	
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	Val	His	Val	Ser	Arg	Val	Gly	Gly	Leu	Glu	Asp	Gln	Leu	Ser	Val	Arg	
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	Gln	Ile	Arg	Tyr	Arg	Val	Glu	Asp	Ser	Val	Asp	Trp	Lys	Val	Val	Asp	
			275					280					285				
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				340					345					350			
	Pro	Arg	Gly	Gly	Glu	Pro	Ser	Ser	Gly	Pro	Val	Arg	Arg	Glu	Leu	Lys	
			355					360					365				
55	Gln	Phe	Leu	Gly	Trp	Leu	Lys	Lys	His	Ala	Tyr	Cys	Ser	Asn	Leu	Ser	
		370					375					380					
	Phe	Arg	Leu	Tyr	Asp	Gln	Trp	Arg	Ala	Trp	Met	Gln	Lys	Ser	His	Lys	
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Thr Arg Asn Gln Val Leu Pro Asp Lys Leu  
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15 Val Pro Arg Gly Gly Ser Gly Ala His Thr Ala Val Ile Ser Pro Gln  
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20 Asp Pro Thr Leu Leu Ile Gly Ser Ser Leu Gln Ala Thr Cys Ser Ile  
 35 40 45

His Gly Asp Thr Pro Gly Ala Thr Ala Glu Gly Leu Tyr Trp Thr Leu  
 50 55 60

25 Asn Gly Arg Arg Leu Pro Ser Leu Ser Arg Leu Leu Asn Thr Ser Thr  
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Leu Ala Leu Ala Leu Ala Asn Leu Asn Gly Ser Arg Gln Gln Ser Gly  
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30 Asp Asn Leu Val Cys His Ala Arg Asp Gly Ser Ile Leu Ala Gly Ser  
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Cys Leu Tyr Val Gly Leu Pro Pro Glu Lys Pro Phe Asn Ile Ser Cys  
 115 120 125

35 Trp Ser Arg Asn Met Lys Asp Leu Thr Cys Arg Trp Thr Pro Gly Ala  
 130 135 140

40 His Gly Glu Thr Phe Leu His Thr Asn Tyr Ser Leu Lys Tyr Lys Leu  
 145 150 155 160

Arg Trp Tyr Gly Gln Asp Asn Thr Cys Glu Glu Tyr His Thr Val Gly  
 165 170 175

45 Pro His Ser Cys His Ile Pro Lys Asp Leu Ala Leu Phe Thr Pro Tyr  
 180 185 190

Glu Ile Trp Val Glu Ala Thr Asn Arg Leu Gly Ser Ala Arg Ser Asp  
 195 200 205

50 Val Leu Thr Leu Asp Val Leu Asp Val Val Thr Thr Asp Pro Pro Pro  
 210 215 220

55 Asp Val His Val Ser Arg Val Gly Gly Leu Glu Asp Gln Leu Ser Val  
 225 230 235 240

Arg Trp Val Ser Pro Pro Ala Leu Lys Asp Phe Leu Phe Gln Ala Lys  
 245 250 255

Tyr Gln Ile Arg Tyr Arg Val Glu Asp Ser Val Asp Trp Lys Val Val  
260 265 270

5 Asp Asp Val Ser Asn Gln Thr Ser Cys Arg Leu Ala Gly Leu Lys Pro  
275 280 285

Gly Thr Val Tyr Phé Val Gln Val Arg Cys Asn Pro Phe Gly Ile Tyr  
290 295 300

10 Gly Ser Lys Lys Ala Gly Ile Trp Ser Glu Trp Ser His Pro Thr Ala  
305 310 315 320

Ala Ser Thr Pro Arg Ser Glu Arg Pro Gly Pro Gly Gly Gly Val Cys  
325 330 335

15 Glu Pro Arg Gly Gly Glu Pro Ser Ser Gly Pro Val Arg Arg Glu Leu  
340 345 350

Lys Gln Phe Leu Gly Trp Leu Lys Lys His Ala Tyr Cys Ser Asn Leu  
355 360 365

Ser Phe Arg Leu Tyr Asp Gln Trp Arg Ala Trp Met Gln Lys Ser His  
370 375 380

25 Lys Thr Arg Asn Gln Asp Glu Gly Ile Leu Pro Ser Gly Arg Arg Gly  
385 390 395 400

Ala Ala Arg Gly Pro Ala Gly  
405

30